Application

PowerSecurity

EN*

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1. General description

The PowerSecurity is a program which enables a remote monitoring of the parameters of power supplies of the PSBEN and EN54 series, which feature a communication interface. In addition, the program enables combining power supply units, previewing the PSU's status, reading the event log and diagrams of electrical parameters and remote battery test.

For proper operation of the software, a PC with Windows XP or newer is required.

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The "PowerSecurity" program can be downloaded at
http://www.pulsar.pl/pliki/PowerSecurity.exe

2. Configuring the connection.

In order to configure the connection between the PSU and the PowerSecurity program, choose the "New Power Supply" option from the "Power Supplies" menu.

The "Configuration of connection" window enables defining necessary parameters of the connection depending on the type of communication interface.

Caution.
Full procedure of configuring the connection is included in the user manual of individual interfaces.

PSU	Description
Name	**PSU's name** - The name that should be assigned individually to each PSU.
Address	**1 ÷ 247;** The address of another PSU, depending on the interface type.
Refresh period of the preview [ms]	**100 ÷ 60 000ms;** Refresh period of the parameters in the preview window.

MODBUS RTU – TCP/IP CONNECTION	Description
Type	**Modbus RTU – TCP/IP** - connection type, depending on the interface type.
TCP Address	**e.g. 192.168.1.100** - TCP connection address.
Port TCP	**e.g. 2101** - A port assigned to the TCP connection.
MODBUS RTU CONNECTION	**Description**
Type	**Modbus RTU** - connection type, depending on the interface type.
Port	**AUTO** – automatic detection of the port to which the interface is connected. **COMx** – manual selection of the port to which the interface is connected, X denotes the port number.
Transmission speed	**AUTO** – Automatic detection of the communication speed. **9600 - 115,200** – manual selection of the communication speed.
Parity checking	**Parity** – checking the parity of the transmission.
Timing parameters of the transmission	**Description**
Response time [ms]	**100 ÷ 60 000ms** – response time depending on the type of interface.
The interval between the transmissions [ms]	**0** - The minimal interval between transmissions.
The number of retransmissions	**3** - The number of retransmissions after which the program reports a connection error.

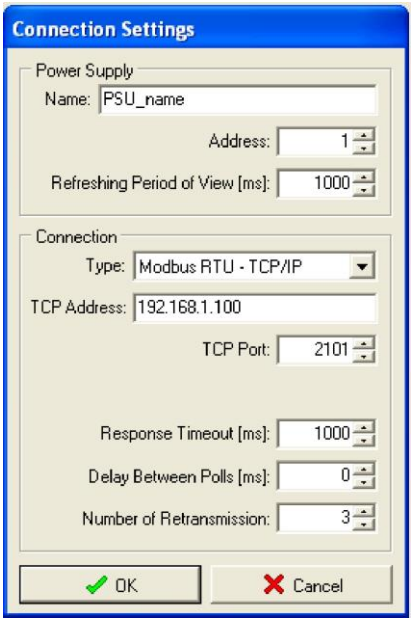


Fig. 1. The connection configuration window - the Modbus RTU-TCP/IP connection.

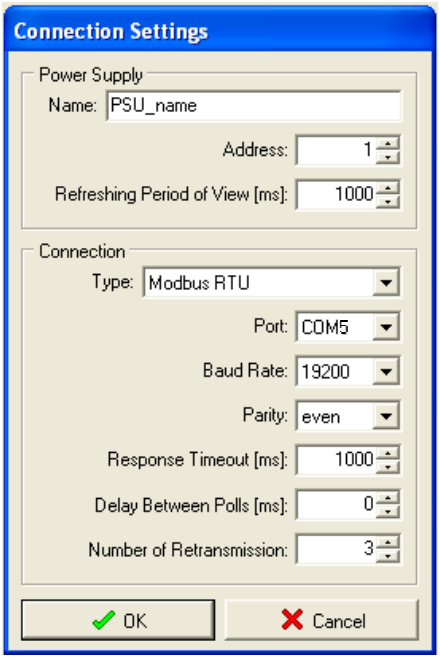


Fig. 2.The connection configuration window – the Modbus RTU connection.

Transmission of information about the status of the power supply system is enabled by the use of PULSAR communications modules for Wi-Fi, Ethernet of RS485 communication. It is also possible to connect the power supply to the computer via the USB-TTL interface.

2.1 The Wi-Fi wireless communication.

The Wi-Fi wireless communication can be implemented on the basis of additional interfaces: Wi-Fi „INTW” and RS485-WiFi, operating within 2,4GHz frequency band, according to the IEEE 802.11 bgn standard.

The WiFi “INTW” interface shall be mounted in a selected location inside the enclosure so that the antenna is exposed to the outside.

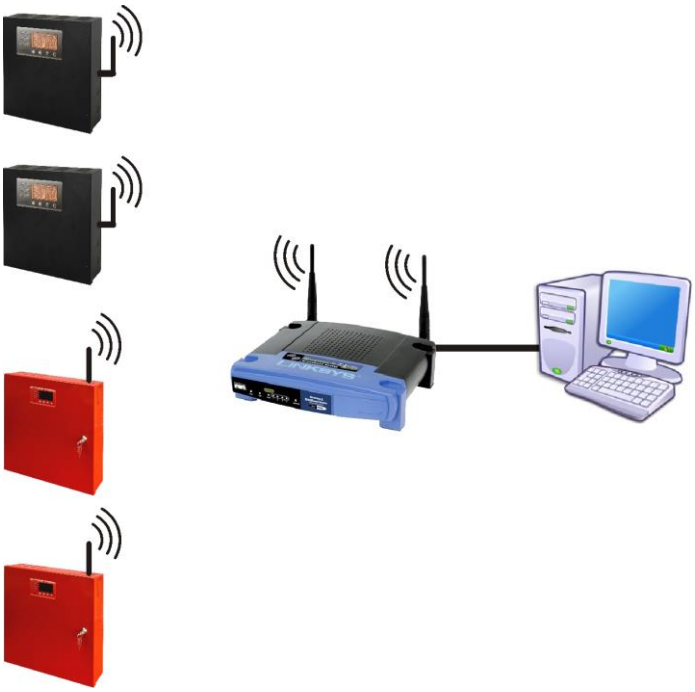


Fig. 3. Wi-Fi communication using WI-FI „INTW” interface.

The connection uses wireless Wi-Fi "INTW" interface and wireless router as an access point.

The RS485-WiFi „INTRW” interface is a device used to convert signals between the RS485 bus and the Wi-Fi network. For proper operation, the unit requires an external power supply in the range of 10÷30V DC e.g. drawn from a PSU of the PSBEN or EN54 series. The unit is mounted in a hermetic enclosure protecting against adverse environmental conditions.

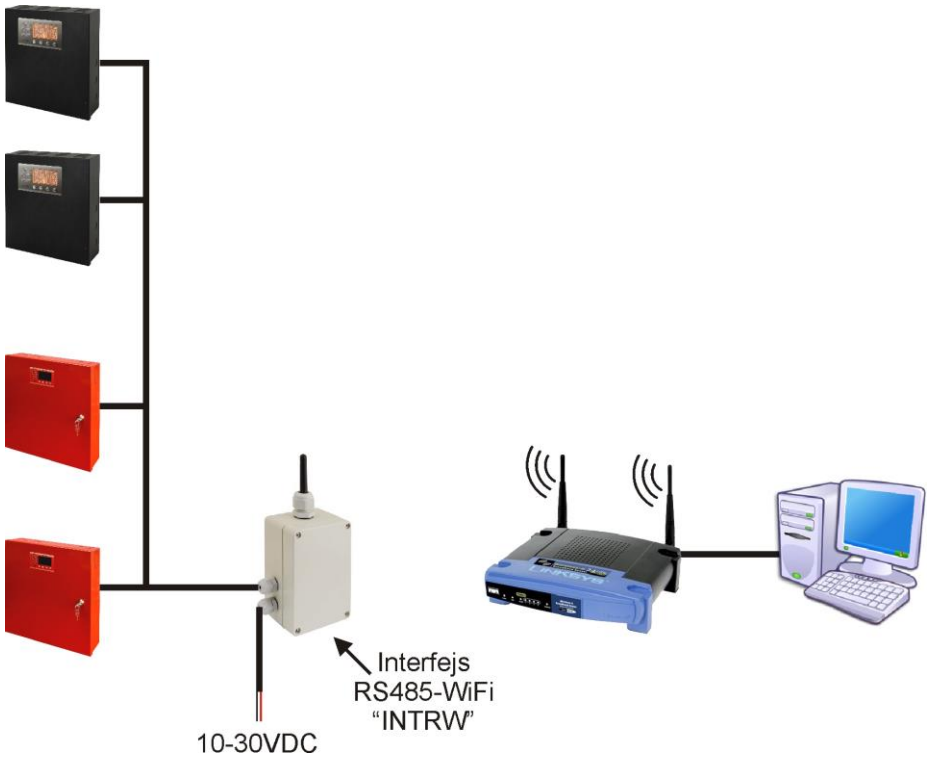


Fig. 4. Wi-Fi communication using the RS485-WiFi „INTRW” interface.

2.2 ETHERNET network communication.

Communication in the Ethernet network is possible due to the additional interfaces: Ethernet „INTE” and RS485-ETH „INTRE”, according to the IEEE802.3 standard.

The Ethernet „INTE” interface features full galvanic isolation and protection against surges. It should be mounted inside the enclosure of the PSU.

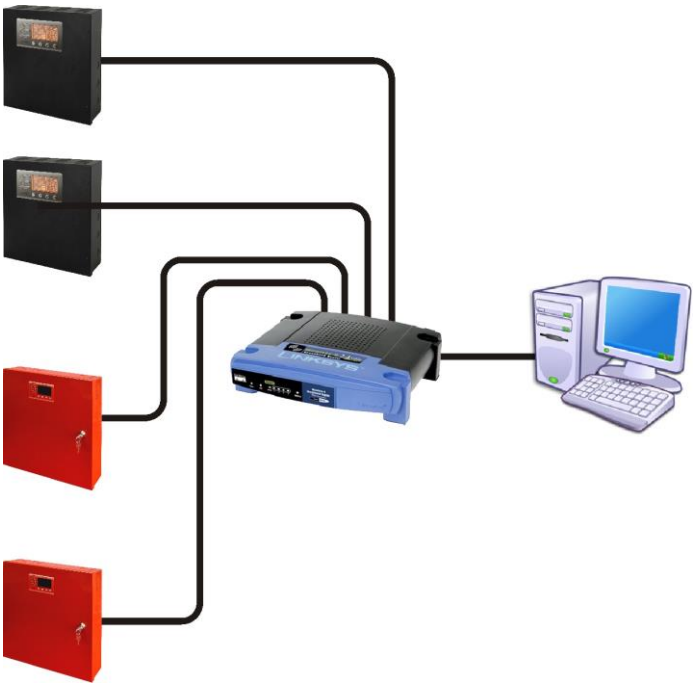


Fig. 5. Ethernet network communication using the Ethernet „INTE” interface.

The RS485-WiFi „INTRE” interface is a device used to convert signals between the RS485 bus and the Ethernet network. For proper operation, the unit requires an external power supply in the range of 10÷30V DC e.g. drawn from a PSU of the PSBEN or EN54 series. The interface features full galvanic isolation and protection against surges. The unit is mounted in a hermetic enclosure protecting against adverse environmental conditions.

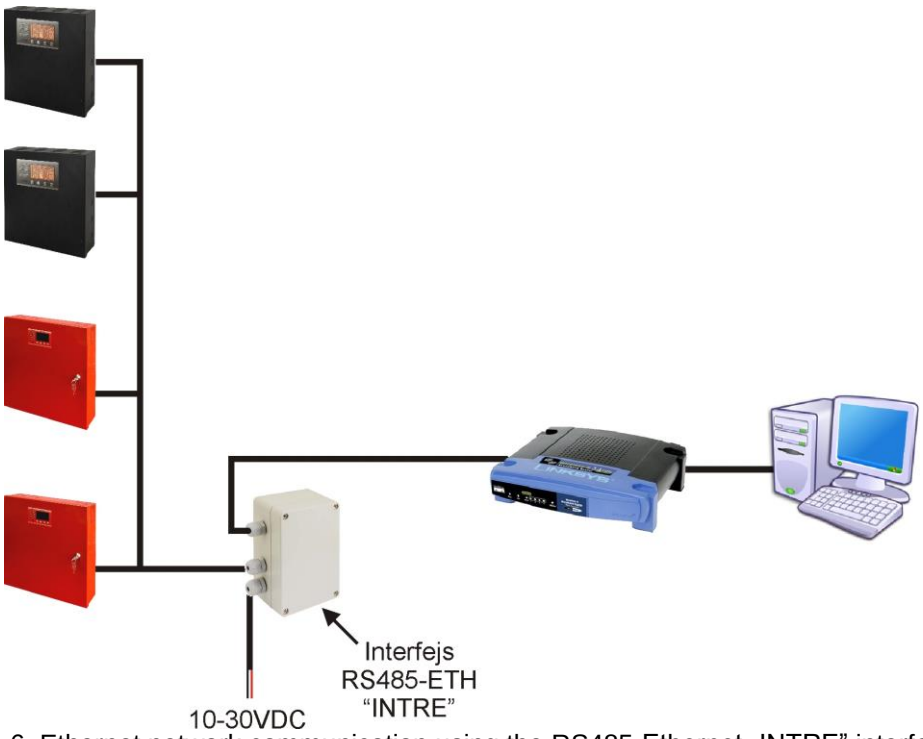


Fig. 6. Ethernet network communication using the RS485-Ethernet „INTRE” interface.

2.3 RS485 network communication.

Another type of network communication is the RS485 communication using two-wire transmission path. To achieve this kind of data exchange, the PSU should be equipped with the additional RS485 TTL "INTR" interface, converting data from the PSU into the RS485 standard and the USB-RS485 "INTUR" interface, converting data from the RS485 network to the USB. Offered interfaces are galvanically isolated and protected against surges.

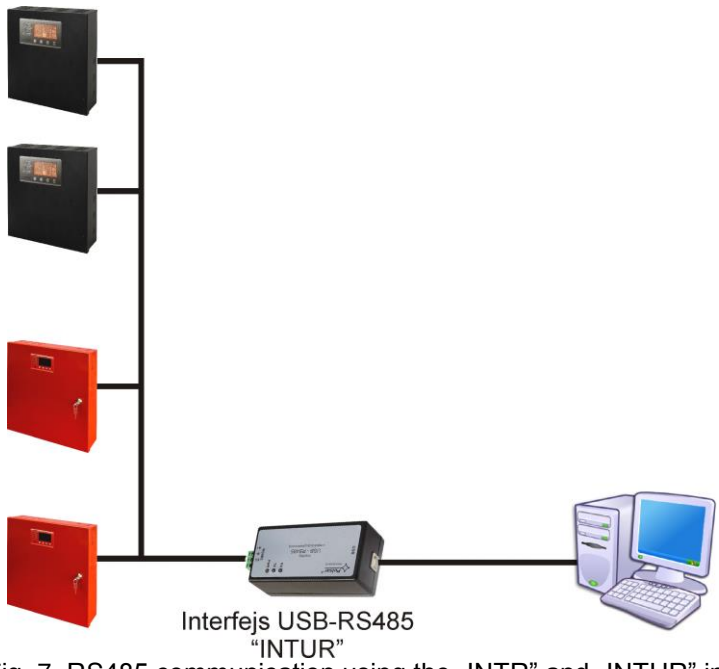


Fig. 7. RS485 communication using the „INTR” and „INTUR” interface.

2.4 USB-TTL communication.

If the power supply does not support any of the above networks, use the USB-TTL interface "INTU" to access the configuration parameters and operation history. This interface enables the connection between the computer and the PSU and is recognized by the operating system as a virtual COM port.

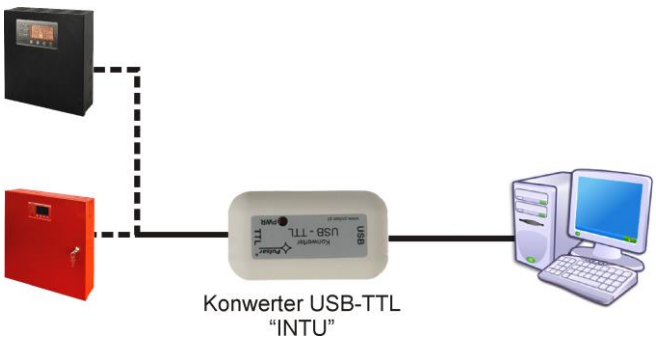


Fig. 8. USB-TTL communication using the USB-TTL „INTU” interface.

3. Application Interface Specifications.

The main interface of the PowerSecurity program is the standard window with the elements and the corresponding functions assigned in an intuitive way. The application allows to configure the connections, analyze the parameters and manage large numbers of power supplies.

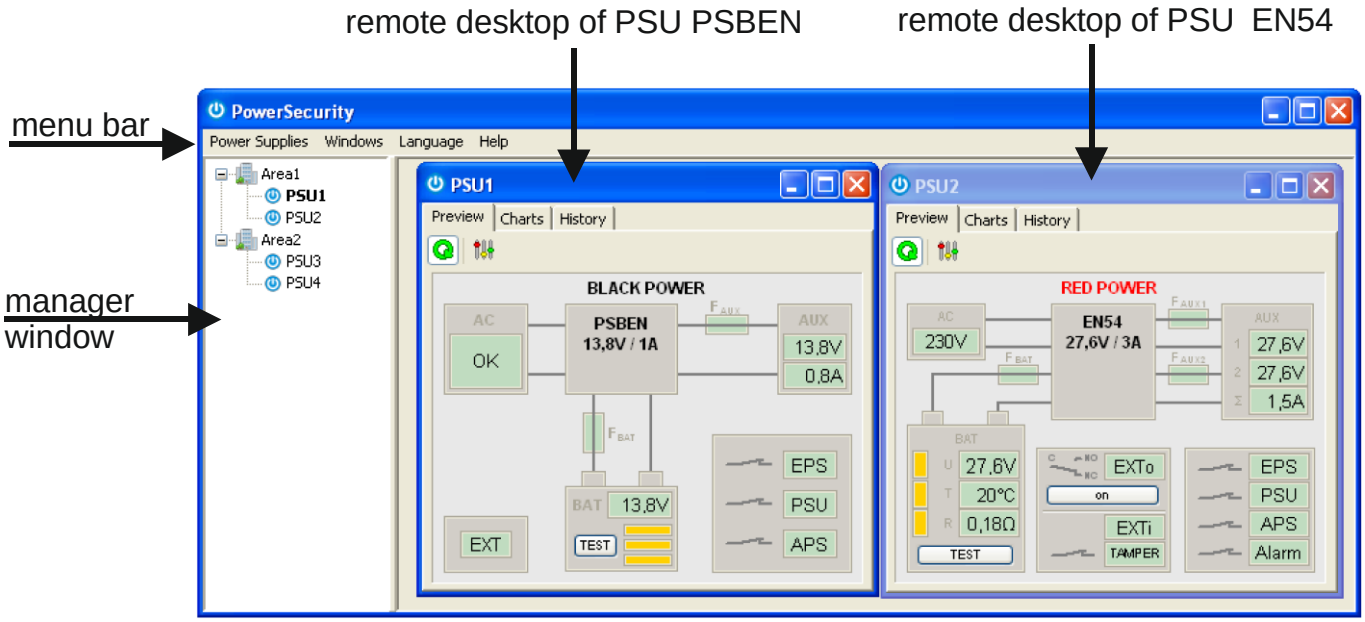


Fig. 9. The „Power security" window.

The main panel can be divided into smaller areas, depending on the number of monitored power supplies.

The program includes a manager mode, which allows combining power supplies for easier analysis and orientation regarding the assignment to the selected areas.

The application allows both the visualization and analysis of the received data. Exceeding the permissible parameters is indicated by indicated by highlighting in red the appropriate area or by flashing warning light. The individual tabs allow to show the power supply parameters on the graph and to read the history of events, along with information about the current state of technical outputs and electrical parameters.

3.1 The MENU bar.

The tabs on the menu bar allow changing the interface language, saving and reading the current configuration and the management of open windows.

The „Power Supplies" Menu	
New Power Supply	Adding a new power supply
Load settings	Load saved settings from a file
Save settings	Save all settings to a file
Exit	Exit the program

The „Windows'' Menu	
Horizontal	Horizontal alignment of windows
Vertical	Vertical alignment of windows
Align	Alignment of windows on the space available in the main window

The „Language” Menu	Allows to choose a language

3.2 Manager window.

The manager window allows to combine the monitored power supplies, giving greater control in case of more complex systems.

During normal operation of the system where all of the connected power supplies are working correctly and do not signal any failures, the names of power supplies are displayed in black (see picture below – Power Supply 1).

If the connection with the power supply has been intentionally disconnected, the power supply is displayed in gray, indicating that the connection with the power supply is disabled (see figure below - Power Supply 3).

In the case of failure of power supply while monitoring the system, the name and the group of a given power supply unit will be highlighted in red (see picture below - Power Supply 2).

Fig. 10. Status indication of the monitored power supplies.

3.3 Remote desktop window.

Remote desktop window of the power supplies displays the panels of the monitored power supplies. Depending on the type of power supply (power supplies of the PSBEN or EN54 series), the program opens the desktop, automatically choosing its appearance and displayed parameters.

The position of the remote desktop window can be set via the "Windows" menu bar.

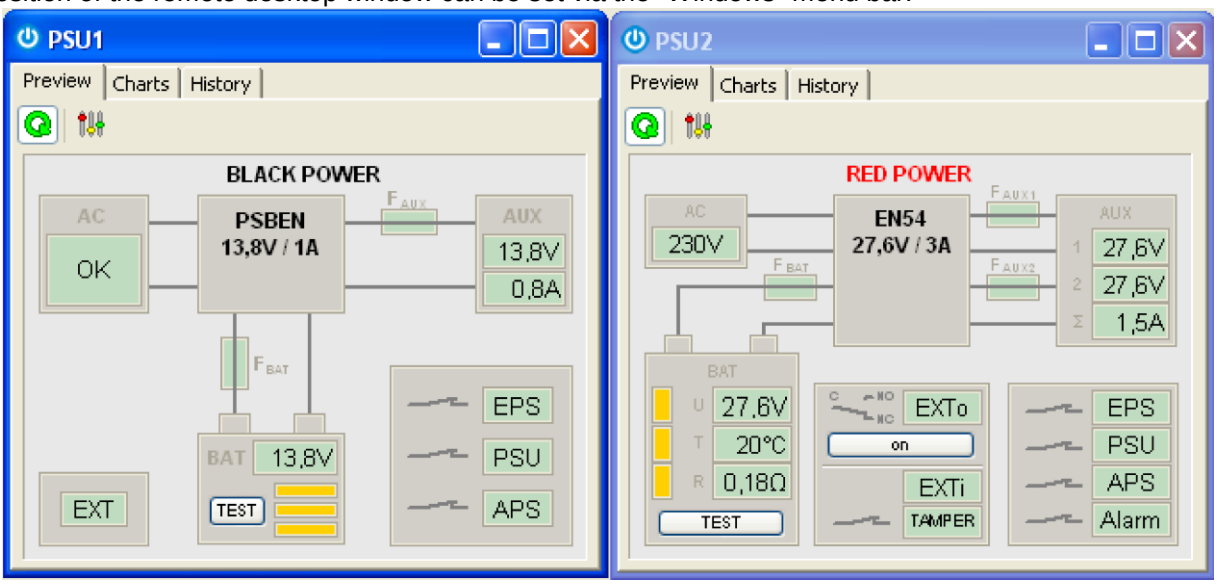


Fig. 11. Remote desktop windows of the power supplies: PSBEN (left), EN54 (right),

4. Window monitoring the PSBEN power supply parameters.

The window monitoring the PSU parameters appears after configuring a new connection or after loading the previously saved configuration. The window contains the title bar with the name of the connected PSU and the menu bar divided into three tabs: preview, charts and history.

4.1 The „Preview" tab

After loading the connection configuration, the "Preview" tab will be displayed. Press the icon in the upper left corner to connect the power supply. Once the connection is established, the current parameters of the power supply, automatically updated according to the refresh cycle set during configuration, will be displayed.

Pressing the icon enables opening the connection configuration window and changing certain communication parameters. If it is necessary to edit the parameters that are not available from this level, close the current connection and open a new one ("New power supply" from the main window).

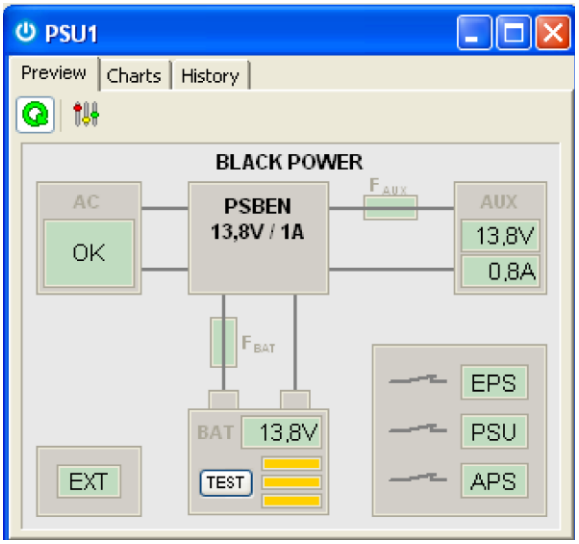
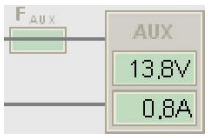
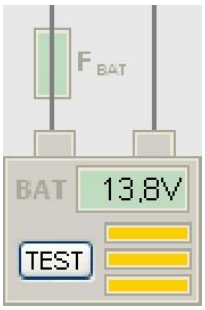
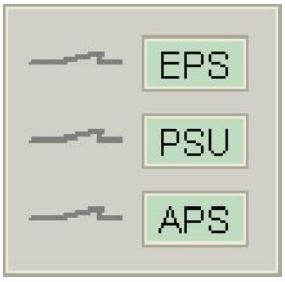


Fig. 12. The „Preview" tab of the PSBEN power supply.

Graphically, the tab of the parameters preview is divided into sections, which symbolically represent the most important components of the power system

The electrical parameters at the AUX output (voltage and current) and the status of the 230V mains supply are monitored. What is more, the battery block shows the actual voltage and the battery charging level. The TEST button performs a remote battery test at any time. The graphic symbols of the technical outputs of power supply are located in the lower right corner. In case of failures, their contacts switch from closed to open position and the backlight changes to red. The EXT window located in the lower left corner indicates the status of the input of collective failure – in case of the input activation its backlight changes into red.

 	Mains supply status: 230V mains supply ON: OK. No 230V mains supply
	**Electrical parameters at the AUX output of the PSU:** - output voltage [V] - output current [A] - output fuse status In case of the fuse activation, the symbol changes into red and flashes

	Information window with the PSU type
	**Current battery status:** - battery voltage [V] - charging level - TEST; performing battery test (see section 4.4) - battery fuse status In case of the fuse activation, the symbol changes to red and flashes.
	Input of collective failure EXT IN status. In case of the input activation, its backlight changes into red.
	**Status of the technical outputs of the PSU.** **EPS -** AC power ON indication open, red backlight = AC power failure closed, green backlight = AC power ON:OK. **PSU** – PSU failure indication open, red backlight = failure closed, green backlight = PSU status OK. **APS** – battery failure indication open, red backlight = battery failure closed, green backlight = battery OK. Failure example, the output is open and highlighted in red.

4.2 The „Diagrams” tab

The ”Diagrams” tab enables reading the history of the parameters (current, voltage) stored in the internal memory of the PSU and reading the values from the charts. The ”Diagrams” tab is available only for power supplies with LCD display.

During normal operation, the PSU records the voltage and current values at the AUX output circuit and saves them in the internal nonvolatile memory. Recording is performed at 5 minute intervals and the memory capacity allows for about 6100 entries. The data is stored in the circular buffer: when the memory is full, the oldest entries are overwritten by the new ones.

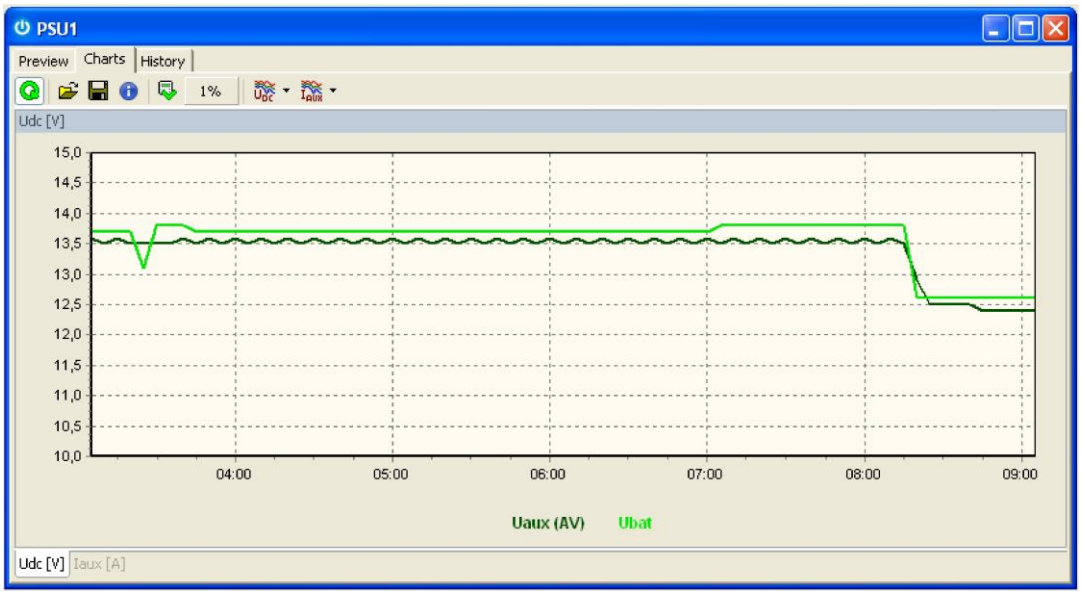


Fig. 13. The „Diagrams” tab.

To read the internal memory of the power supply, press the button in the upper left corner. Depending on the amount of data recorded, the reading can take from a few seconds up to several minutes. The reading starts from the most recent entries and its progress is displayed as a percentage value. The reading can be stopped at any time by pressing the button.

The diagram presents the following parameters:
- **Uaux** - output voltage (mean value within 5 minutes)
- **Uaux min** - minimum output voltage
- **Uaux max** - maximum output voltage
- **Ubat** - battery voltage (mean value within 5 minutes)
- **Iaux** - output current (mean value within 5 minutes)
- **Iaux max** - maximum output current
- **Iaux min** - minimum output current

The chart's color corresponds to the color of the label located below.
To indicate whether the individual minimum, maximum or average values should be visible on the diagram, use the toolbar icons, e.g. .

The diagram window can be scaled by pressing the left mouse button and selecting the area to be enlarged. To enlarge the selected diagram, press the mouse button and move the mouse from left to right. To return to normal scale, move the mouse from right to left.

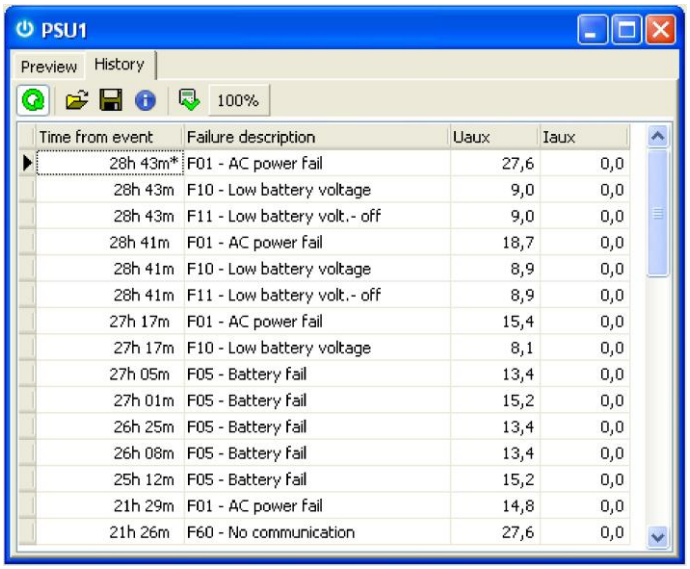
The program enables storing the read data for further analysis. Press the button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.
The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the button. This information is particularly useful when importing a file from another PSU.

4.3 The „History'' tab

The „History'' tab enables reading the history of events stored in the memory of the PSU in case of any incorrect parameters during operation.
There are two history windows available, depending on the type of power supply:
- The power supplies with seven-segment LED can display the history of the last 30 events.
- The power supplies with LCD displays are fitted with an additional memory system that allows storing over 2000 events containing more detailed information about the status of the power supply.

4.3.1 Reading the history of events of the power supply with LED display.

To read the history of events of the power supply with LED display press the button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the button.


PSU1
Preview
History
100%
Time from event
Failure description
Uaux
Iaux
28h 43m* F01 - AC power fail 27,6 0,0
28h 43m F10 - Low battery voltage 9,0 0,0
28h 43m F11 - Low battery volt.- off 9,0 0,0
28h 41m F01 - AC power fail 18,7 0,0
28h 41m F10 - Low battery voltage 8,9 0,0
28h 41m F11 - Low battery volt.- off 8,9 0,0
27h 17m F01 - AC power fail 15,4 0,0
27h 17m F10 - Low battery voltage 8,1 0,0
27h 05m F05 - Battery fail 13,4 0,0
27h 01m F05 - Battery fail 15,2 0,0
26h 25m F05 - Battery fail 13,4 0,0
26h 08m F05 - Battery fail 13,4 0,0
25h 12m F05 - Battery fail 15,2 0,0
21h 29m F01 - AC power fail 14,8 0,0
21h 26m F60 - No communication 27,6 0,0
Fig. 14. The „History'' tab.

The table of the history of events of the power supply includes information about:

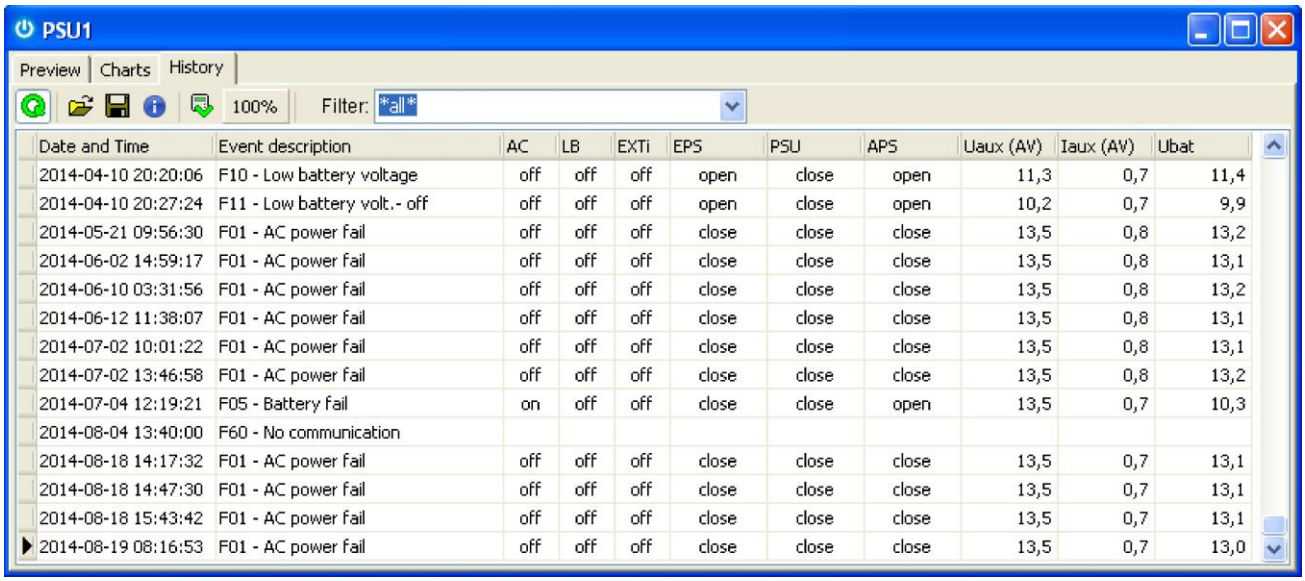
- The time elapsed since the event – the time that has elapsed since the occurrence of the event. For example 4h 54m means that the event occurred 4 hours and 54 minutes ago.
  In case of power loss (no 230V AC mains supply) during the PSU operation while the battery is not connected or fully discharged, the information about the time until the next switch of the power supply is lost. In such a case, an asterisk symbol appears next to the time display, e.g. 4h 53m *, informing about the situation.
- Event description – event code and its description. Appendixes A, B and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- Uaux, Iaux – output voltage and output current saved in the memory at the time of a given event.

The program enables storing the read data for further analysis. Press the button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the button. This information is particularly useful when importing a file from another PSU.

4.3.2 Reading the history of events of the power supply with LCD display.

To read the history of events of the power supply with LCD display press the button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the button.



Date and Time	Event description	AC	LB	EXTi	EPS	PSU	APS	Uaux (AV)	Iaux (AV)	Ubat
2014-04-10 20:20:06	F10 - Low battery voltage	off	off	off	open	close	open	11,3	0,7	11,4
2014-04-10 20:27:24	F11 - Low battery volt.- off	off	off	off	open	close	open	10,2	0,7	9,9
2014-05-21 09:56:30	F01 - AC power fail	off	off	off	close	close	close	13,5	0,8	13,2
2014-06-02 14:59:17	F01 - AC power fail	off	off	off	close	close	close	13,5	0,8	13,1
2014-06-10 03:31:56	F01 - AC power fail	off	off	off	close	close	close	13,5	0,8	13,2
2014-06-12 11:38:07	F01 - AC power fail	off	off	off	close	close	close	13,5	0,8	13,1
2014-07-02 10:01:22	F01 - AC power fail	off	off	off	close	close	close	13,5	0,8	13,1
2014-07-02 13:46:58	F01 - AC power fail	off	off	off	close	close	close	13,5	0,8	13,2
2014-07-04 12:19:21	F05 - Battery fail	on	off	off	close	close	open	13,5	0,7	10,3
2014-08-04 13:40:00	F60 - No communication									
2014-08-18 14:17:32	F01 - AC power fail	off	off	off	close	close	close	13,5	0,7	13,1
2014-08-18 14:47:30	F01 - AC power fail	off	off	off	close	close	close	13,5	0,7	13,1
2014-08-18 15:43:42	F01 - AC power fail	off	off	off	close	close	close	13,5	0,7	13,1
2014-08-19 08:16:53	F01 - AC power fail	off	off	off	close	close	close	13,5	0,7	13,0

Fig. 15. The „History'' tab.

The table of the history of events of the power supply includes information about:

- Time and date – date and time of the event
- Event description – event code and its description. Appendixes A, B, and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- AC – AC 230V power indication:
  ON = AC power on
  OFF = AC power off
- LB – battery charging indication
  ON = battery charging
  OFF = no charging, battery fully charged
- EXTi – status of the technical input
  ON = input activated
  OFF = input not activated

- EPS – technical output indicating AC power loss
  open = AC power loss
  closed = AC power - OK.
- PSU – technical output indicating PSU failure
  open = failure
  closed = PSU operation - OK.
- APS – technical output indicating battery failure
  open = battery failure
  closed = battery OK.
- Uaux (avg)– output voltage, mean value
- Iaux (avg) output current, mean value
- Ubat – battery voltage

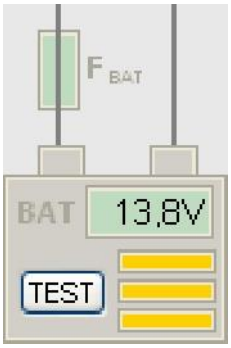
Use the “Filter” menu on the toolbar to filter the displayed events by the selected event code.

The program enables storing the read data for further analysis. Press the button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the button. This information is particularly useful when importing a file from another PSU.

4.4 Remote battery test

In the „Preview” tab, use the „TEST” button on the battery icon to perform the remote battery test.



After pressing the button, the battery test command is sent to the power supply. If the battery is OK, it will be indicated by the ”Battery OK” message once the test is completed. If the battery is discharged or worn out, it will be indicated by the ”Battery failure” message.

The battery test will not be performed if the PSU is not configured to operate without battery.

5. Window monitoring the EN54 power supply parameters.

The window monitoring the PSU parameters appears after configuring a new connection or after loading the previously saved configuration. The window contains the title bar with the name of the connected PSU and the menu bar divided into three tabs: preview, charts and history.

5.1 The „Preview" tab

After loading the connection configuration, the "Preview" tab will be displayed. Press the icon in the upper left corner to connect the power supply. Once the connection is established, the current parameters of the power supply, automatically updated according to the refresh cycle set during configuration, will be displayed.

Pressing the icon enables opening the connection configuration window and changing certain communication parameters. If it is necessary to edit the parameters that are not available from this level, close the current connection and open a new one ("New power supply" from the main window).

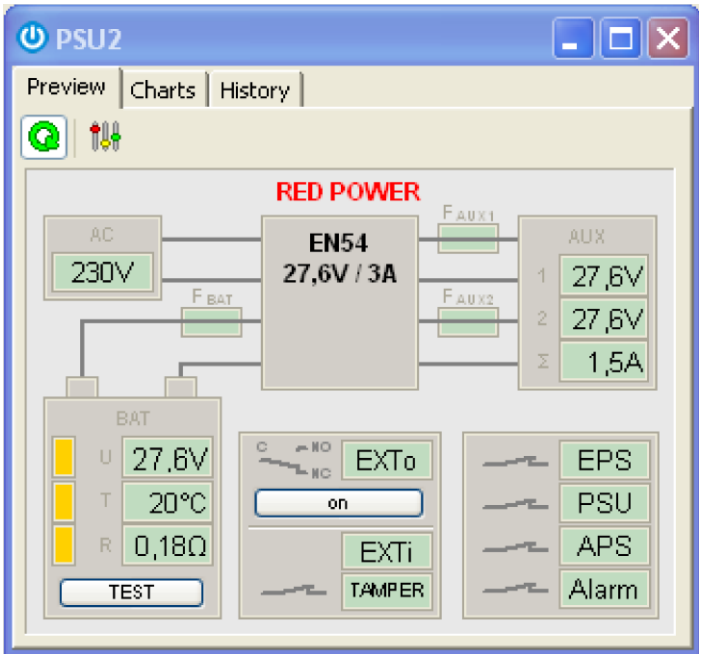


Fig. 16. The „Preview" tab of the EN54 power supply.

Graphically, the tab of the parameters preview is divided into sections, which symbolically represent the most important components of the power system.

The electrical parameters at the AUX1 and AUX2 outputs (output voltages and total current), the status of the 230V mains supply (ON/OFF) and the voltage value are monitored. What is more, the battery block shows the actual voltage, battery charging level and the internal resistance of the battery circuit. The TEST button performs a remote battery test at any time. The graphic symbols of the technical outputs of power supply are located in the lower right corner. In case of failures, their contacts switch from closed to open position and the backlight changes to red. The EXTi window located in the central part indicates the status of the input of collective failure – in case of the input activation its backlight changes into red. The EXTo window indicates the status of the controlled relay output - if the relay is activated, it changes to red. The TAMPER window indicates the status of the tamper input – in case of open circuit (enclosure opening) its backlight changes into red.

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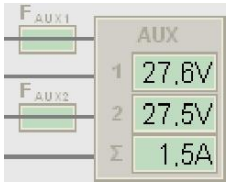
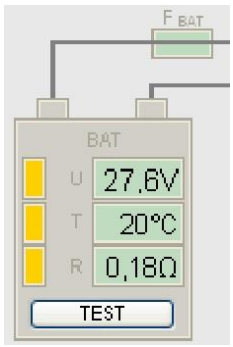
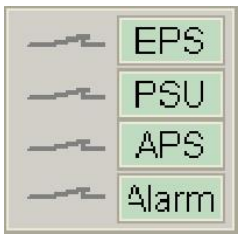
 	Mains supply status (mains supply value) 230V mains supply: - green backlight if the voltage is in the range between 230V -15% - +10% - blue backlight if the voltage is below 230V – 15% - red backlight if the voltage is over 230V +10% No 230V mains supply

<table>
<tr><td> 
</td><td>Electrical parameters at the AUX outputs of the PSU:
- output voltage at the AUX1 output [V]
- output voltage at the AUX2 output [V]
- total output current
- the fuse status at the AUX1 output
- the fuse status at the AUX2 output
 In case of fuse activation, the symbol changes to red and flashes.</td></tr>
<tr><td>
</td><td>Information window with the PSU type</td></tr>
<tr><td> 
</td><td>Current battery status:
- battery voltage [V]
- charging level
- TEST: performing battery test (see section 5.4)
- battery fuse status
- battery temperature
- resistance of the battery circuit

 In case of fuse activation, the symbol changes to red and flashes.</td></tr>
<tr><td>
</td><td>EXTo - controlled relay output EXTo status.
its backlight changes into red and the contacts change their position (C closed with NO)
On – the start button of the controlled relay output EXTo.
EXTi – input of the collective failure EXTi status.
In case of the input activation, its backlight changes into red.
TAMPER – TAMPER input status.
In case of the input activation, its backlight changes into red and the contacts change their position (opening).</td></tr>
<tr><td> 
</td><td>Status of the technical outputs of the PSU.
EPS - AC power ON indication
open, red backlight = AC power failure
closed, green backlight = AC power ON:OK.
PSU – PSU failure indication
open, red backlight = failure
closed, green backlight = PSU status OK.
APS – battery failure indication
open, red backlight = battery failure
closed, green backlight = battery OK.
ALARM – collective failure indication

 Fault example, the output is open and highlighted in red.</td></tr>
</table>

5.2 The „Diagrams” tab

The ”Diagrams” tab enables reading the history of the parameters (current, voltage) stored in the internal memory of the PSU and reading the values from the charts. The ”Diagrams” tab is available only for power supplies with LCD display.

During normal operation, the PSU records the voltage and current values at the AUX output circuit and saves them in the internal nonvolatile memory. Recording is performed at 5 minute intervals and the memory capacity allows for about 6100 entries. The data is stored in the circular buffer: when the memory is full, the oldest entries are overwritten by the new ones.

Fig. 17. The „Diagrams” tab.

To read the internal memory of the power supply, press the button in the upper left corner. Depending on the amount of data recorded, the reading can take from a few seconds up to several minutes. The reading starts from the most recent entries and its progress is displayed as a percentage value. The reading can be stopped at any time by pressing the button.

The diagram presents the following parameters:
- **Uaux1 avg** - AUX1 output voltage (mean value within 5 minutes)
- **Uaux1 min** - minimum output voltage at the AUX1
- **Uaux1 max** - maximum output voltage at the AUX1

- **Uaux2 avg** - AUX2 output voltage (mean value within 5 minutes)
- **Uaux2 min** - minimum output voltage at the AUX2
- **Uaux2 max** - maximum output voltage at the AUX2

- **Uac avg** - mains supply (mean value within 5 minutes)
- **Uac min** - minimum mains supply
- **Uac max** - maximum mains supply

- **Ubat** - battery voltage (mean value within 5 minutes)
- **Ubat min** - minimum battery voltage
- **Ubat max** - maximum battery voltage

- **Iaux** - total output current (mean value within 5 minutes)
- **Iaux max** - maximum total output current
- **Iaux min** - minimum total output current

- **Tbat** - battery temperature
- **Rbat** - resistance of the battery circuit

The chart’s color corresponds to the color of the label located below.
To indicate whether the individual minimum, maximum or average values should be visible on the diagram, use the toolbar icons, e.g. .

The diagram window can be scaled by pressing the left mouse button and selecting the area to be enlarged. To enlarge the selected diagram, press the mouse button and move the mouse from left to right. To return to normal scale, move the mouse from right to left.

The program enables storing the read data for further analysis. Press the button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the button. This information is particularly useful when importing a file from another PSU.

5.3 The „History'' tab

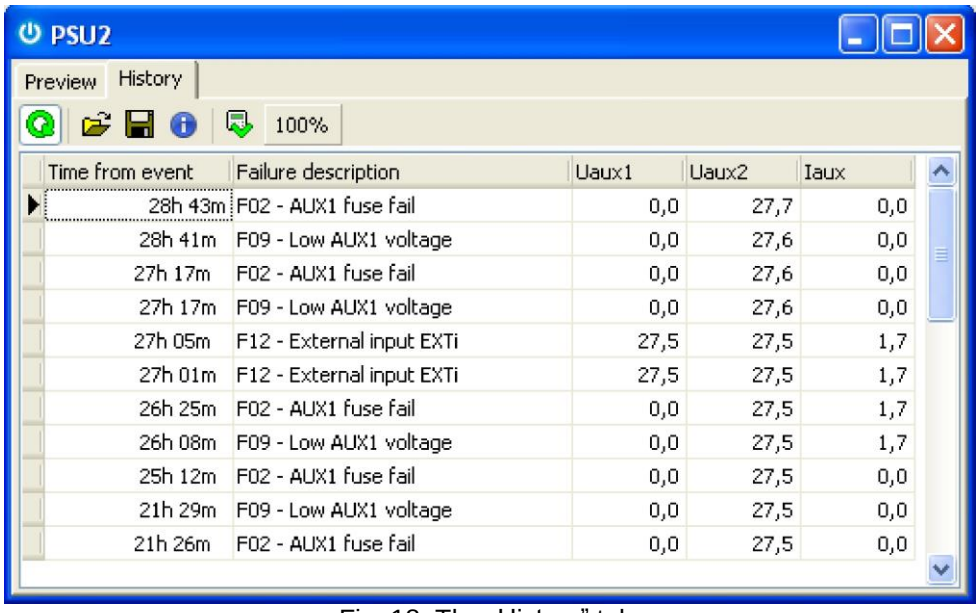
The „History'' tab enables reading the history of events stored in the memory of the PSU in case of any incorrect parameters during operation.

There are two history windows available, depending on the type of power supply:

- The power supplies with seven-segment LED can display the history of the last 30 events.
- The power supplies with LCD displays are fitted with an additional memory system that allows storing over 2000 events containing more detailed information about the status of the power supply.

5.3.1 Reading the history of events of the power supply with LED display.

To read the history of events of the power supply with LED display press the button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the button.



Time from event	Failure description	Uaux1	Uaux2	Iaux
28h 43m	F02 - AUX1 fuse fail	0,0	27,7	0,0
28h 41m	F09 - Low AUX1 voltage	0,0	27,6	0,0
27h 17m	F02 - AUX1 fuse fail	0,0	27,6	0,0
27h 17m	F09 - Low AUX1 voltage	0,0	27,6	0,0
27h 05m	F12 - External input EXTi	27,5	27,5	1,7
27h 01m	F12 - External input EXTi	27,5	27,5	1,7
26h 25m	F02 - AUX1 fuse fail	0,0	27,5	1,7
26h 08m	F09 - Low AUX1 voltage	0,0	27,5	1,7
25h 12m	F02 - AUX1 fuse fail	0,0	27,5	0,0
21h 29m	F09 - Low AUX1 voltage	0,0	27,5	0,0
21h 26m	F02 - AUX1 fuse fail	0,0	27,5	0,0

Fig. 18. The „History" tab.

The table of the history of events of the power supply includes information about:

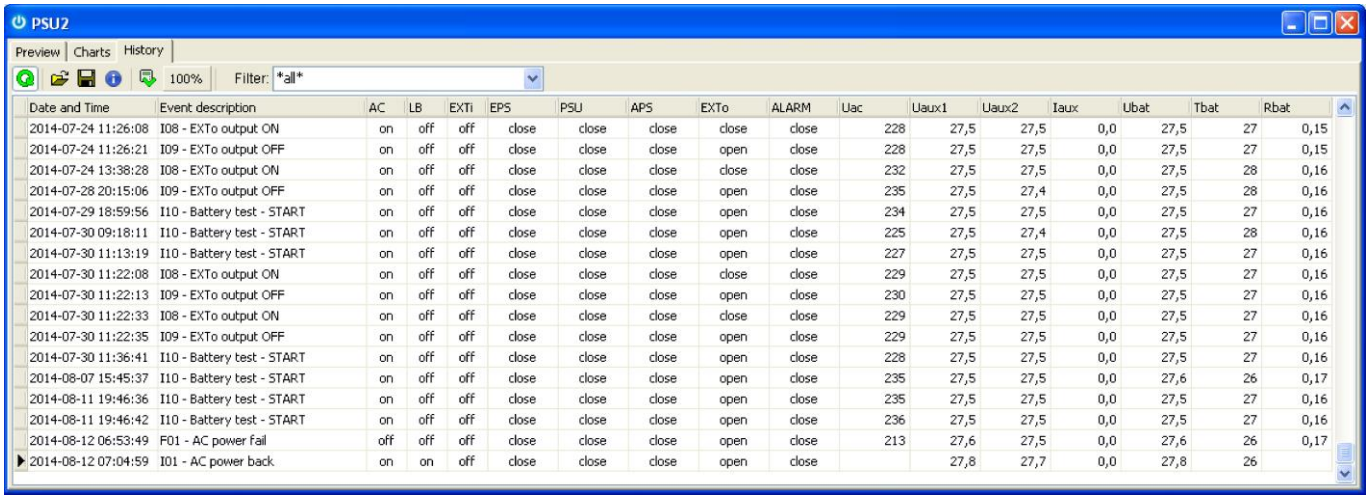
- The time elapsed since the event – the time that has elapsed since the occurrence of the event. For example 4h 54m means that the event occurred 4 hours and 54 minutes ago.
  In case of power loss (no 230V AC mains supply) during the PSU operation while the battery is not connected or fully discharged, the information about the time until the next switch of the power supply is lost. In such a case, an asterisk symbol appears next to the time display e.g. 4h 53m *.
- Event description – event code and its description. Appendixes A, B and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- Uaux, Iaux – output voltage and output current saved in the memory at the time of a given event.

The program enables storing the read data for further analysis. Press the button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the button. This information is particularly useful when importing a file from another PSU.

5.3.2 Reading the history of events of the power supply with LCD display.

To read the history of events of the power supply with LCD display press the button. The reading starts from the most recent entries. The reading can be stopped at any time by pressing the button.



Date and Time	Event description	AC	LB	EXTi	EPS	PSU	APS	EXTo	ALARM	Uac	Uaux1	Uaux2	Iaux	Ubat	Tbat	Rbat
2014-07-24 11:26:08	I08 - EXTo output ON	on	off	off	close	close	close	close	close	228	27,5	27,5	0,0	27,5	27	0,15
2014-07-24 11:26:21	I09 - EXTo output OFF	on	off	off	close	close	close	open	close	228	27,5	27,5	0,0	27,5	27	0,15
2014-07-24 13:38:28	I08 - EXTo output ON	on	off	off	close	close	close	close	close	232	27,5	27,5	0,0	27,5	28	0,16
2014-07-28 20:15:06	I09 - EXTo output OFF	on	off	off	close	close	close	open	close	235	27,5	27,4	0,0	27,5	28	0,16
2014-07-29 18:59:56	I10 - Battery test - START	on	off	off	close	close	close	open	close	234	27,5	27,5	0,0	27,5	27	0,16
2014-07-30 09:18:11	I10 - Battery test - START	on	off	off	close	close	close	open	close	225	27,5	27,4	0,0	27,5	28	0,16
2014-07-30 11:13:19	I10 - Battery test - START	on	off	off	close	close	close	open	close	227	27,5	27,5	0,0	27,5	27	0,16
2014-07-30 11:22:08	I08 - EXTo output ON	on	off	off	close	close	close	close	close	229	27,5	27,5	0,0	27,5	27	0,16
2014-07-30 11:22:13	I09 - EXTo output OFF	on	off	off	close	close	close	open	close	230	27,5	27,5	0,0	27,5	27	0,16
2014-07-30 11:22:33	I08 - EXTo output ON	on	off	off	close	close	close	close	close	229	27,5	27,5	0,0	27,5	27	0,16
2014-07-30 11:22:35	I09 - EXTo output OFF	on	off	off	close	close	close	open	close	229	27,5	27,5	0,0	27,5	27	0,16
2014-07-30 11:36:41	I10 - Battery test - START	on	off	off	close	close	close	open	close	228	27,5	27,5	0,0	27,5	27	0,16
2014-08-07 15:45:37	I10 - Battery test - START	on	off	off	close	close	close	open	close	235	27,5	27,5	0,0	27,6	26	0,17
2014-08-11 19:46:36	I10 - Battery test - START	on	off	off	close	close	close	open	close	235	27,5	27,5	0,0	27,5	27	0,16
2014-08-11 19:46:42	I10 - Battery test - START	on	off	off	close	close	close	open	close	236	27,5	27,5	0,0	27,5	27	0,16
2014-08-12 06:53:49	F01 - AC power fail	off	off	off	close	close	close	open	close	213	27,6	27,5	0,0	27,6	26	0,17
2014-08-12 07:04:59	I01 - AC power back	on	on	off	close	close	close	open	close		27,8	27,7	0,0	27,8	26	

Fig. 19. The „History” tab.

The table of the history of events of the power supply includes information about:

- Time and date – date and time of the event
- Event description – event code and its description. Appendixes A, B and C at the end of the manual summarize all the failure and event codes that may occur during the power supply operation. The individual codes are accompanied by appropriate optical indication on the panel, acoustic indication and activation of the dedicated technical output.
- AC – AC 230V power indication:
  ON = AC power on
  OFF = AC power off
- LB – battery charging indication
  ON= battery charging
  OFF = no charging, battery fully charged
- EXTi – external failure input
  ON = failure
  OFF = normal status
- EPS – technical output indicating AC power loss
  Open = AC power loss
  closed = AC power - OK.
- PSU – technical output indicating PSU failure
  open = failure
  closed = PSU operation - OK
- APS – technical output indicating battery failure
  open = battery failure
  closed = battery OK
- EXTo – controlled relay output
  open = output on
  closed = output off
- ALARM – technical output of collective failure
  Open = AC power loss
  closed = AC power - OK.

- Uac – 230V AC mains supply voltage
- Uaux1 – voltage at the AUX1 output
- Uaux2 - voltage at the AUX1 output
- Iaux – total output current
- Tbat – battery temperature
- Rbat – resistance of the battery circuit

Use the “Filter” menu on the toolbar to filter the displayed events by the selected event code.

The program enables storing the read data for further analysis. Press the button to save the data in .csv or .dat format, allowing reloading and displaying data in a chart window.

The information about the type of power supply, its position in the manager list and the communication address can be obtained by pressing the button. This information is particularly useful when importing a file from another PSU

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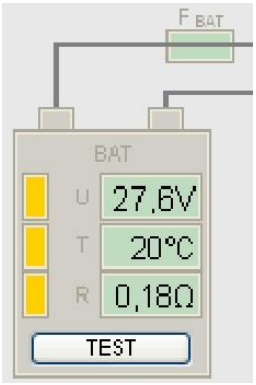
5.4 Remote battery test



In the „Preview” tab, use the „TEST” button on the battery icon to perform the remote battery test.

After pressing the button, the battery test command is sent to the power supply. If the battery is OK, it will be indicated by the ”Battery OK” message once the test is completed. If the battery is discharged or worn out, it will be indicated by the ”Battery failure” message.

After pressing the TEST button, it remains inactive for about 30 seconds before it can be used again.

APPENDIX A – FAILURE CODES OF THE PSBEN 13,8V POWER SUPPLY

Failure code	Information	Technical output activation	Causes, comments
F01	No AC power!	EPS FLT	- No AC mains supply - F_{MAIN} fuse failure
F02	AUX Fuse!	PSU FLT	- Blown F_{AUX} fuse - AUX output overload
F03	BAT fuse!	APS FLT	- Blown F_{BAT} fuse - Short circuit in the battery circuit - Short circuit in the AUX output circuit
F04	Output overload!!	PSU FLT	- PSU overload
F05	Faulty battery!	APS FLT	- Worn out batteries - Undercharged batteries - Battery not connected
F06	High AUX voltage!	PSU FLT	- The output voltage of the PSU over 14.7V
F07	High battery voltage!	PSU FLT	- Battery voltage >14V
F08	Battery charging circuit failure!	PSU FLT	- The output voltage of the PSU set too low , below 13V - Battery charging circuit failure
F09	Low AUX voltage!	PSU FLT	- The output voltage below 11.8V (during buffer operation)
F10	Low battery voltage!	APS FLT	- The battery voltage has dropped below 11.5V (during battery-assisted operation)
F11	Low battery voltage – off!	APS FLT	- the battery voltage has dropped below 10V (during battery-assisted operation)
F12	EXT external input!	ALARM	- Activation of the input of collective failure: EXT IN
F13	PSU enclosure opening!	PSU FLT	
F50-F54	Internal damage of the PSU.	PSU FLT	- service codes
F60	No communication	PSU FLT	- no communication with LCD panel
F61-F64	LCD damage	PSU FLT	- service codes
F65	Access unlocked		- passwords unlocked

Event code	Description
I00	PSU start-up
I01	AC power restored
I02	AUX fuse replaced
I03	BAT fuse replaced
I04	Battery status: OK
I05	Battery test – START
I06	Enclosure closed

APPENDIX B – FAILURE CODES OF THE PSBEN 27,6V POWER SUPPLY

Failure code	Information	Technical output activation	Causes, comments
F01	No AC power!	EPS FLT	- No AC mains supply - F_{MAIN} fuse failure
F02	AUX Fuse!	PSU FLT	- Blown F_{AUX} fuse - AUX output overload
F03	BAT fuse!	APS FLT	- Blown F_{BAT} fuse - Short circuit in the battery circuit - Short circuit in the AUX output circuit
F04	Output overload!!	PSU FLT	- PSU overload
F05	Faulty battery!	APS FLT	- Worn out batteries - Undercharged batteries - Battery not connected
F06	High AUX voltage!	PSU FLT	- The output voltage of the PSU over 29.4V
F07	High battery voltage!	PSU FLT	- Battery voltage >28V
F08	Battery charging circuit failure!	PSU FLT	- The output voltage of the PSU set too low , below 26V - Battery charging circuit failure
F09	Low AUX voltage!	PSU FLT	- The output voltage below 23,6V (during buffer operation)
F10	Low battery voltage!	APS FLT	- The battery voltage has dropped below 23V (during battery-assisted operation)
F11	Low battery voltage – off!	APS FLT	- the battery voltage has dropped below 20V (during battery-assisted operation)
F12	EXT external input!	ALARM	- Activation of the input of collective failure: EXTi
F13	PSU enclosure opening!	PSU FLT	
F50-F54	Internal damage of the PSU.	PSU FLT	- service codes
F60	No communication	PSU FLT	- no communication with LCD panel
F61-F64	LCD damage	PSU FLT	- service codes
F65	Access unlocked		- passwords unlocked

Event code	Description
I00	PSU start-up
I01	AC power restored
I02	AUX fuse replaced
I03	BAT fuse replaced
I04	Battery status: OK
I05	Battery test – START
I06	Enclosure closed

APPENDIX C – FAILURE CODES OF THE EN54 27,6V POWER SUPPLY

Failure code	Information	Technical output activation	Causes, comments
F01	No AC power!	EPS FLT ALARM	- No AC mains supply - F_{MAIN} fuse failure
F02	AUX1 fuse!	PSU FLT ALARM	- Blown F_{AUX1} fuse
	AUX2 fuse!		- Blown F_{AUX2} fuse
F03	BAT fuse!	APS FLT ALARM	- Blown F_{BAT} fuse - Short circuit in the battery circuit - Short circuit in the AUX1 and AUX2 output circuit
F04	Output overload!!	PSU FLT ALARM	- PSU overload
F05	Undercharged battery!	APS FLT ALARM	- Worn out batteries - Undercharged batteries
F06	High AUX1 voltage!	PSU FLT ALARM	- The output voltage of the PSU over 29.2V
	High AUX2 voltage!		
F08	Battery charging circuit failure!	PSU FLT ALARM	- The output voltage of the PSU set too low , below 26V - Battery charging circuit failure
F09	Low AUX1 voltage!	PSU FLT ALARM	- The output voltage below 26V
	Low AUX2 voltage!		
F10	Low battery voltage!	APS FLT ALARM	- The battery voltage has dropped below 23V (during battery-assisted operation)
F11	Low battery voltage – off!	APS FLT ALARM	- the battery voltage has dropped below 20V (during battery-assisted operation)
F12	EXT external input!	ALARM	- Activation of the input of collective failure: EXTi
F14	Temperature sensor failure!	PSU FLT ALARM	- Temperature sensor failure - Temperature sensor disconnected
F15	High battery temperature	PSU FLT ALARM	- Too high ambient temperature of the PSU. - Overloaded batteries. - Faulty batteries.
F16	No battery!	APS FLT ALARM	- Disconnected batteries
F17	Battery failure!	APS FLT ALARM	- Deeply discharged batteries, voltage below 20V
F18	High resistance of the. Battery circuit!	APS FLT ALARM	- Worn out batteries - Loose cables connecting the batteries
F19	High AC voltage!	PSU FLT ALARM	- Mains supply over 254V AC
F20	Low AC voltage!	PSU FLT ALARM	- Mains supply below 195V AC
F21	Enclosure opening!	PSU FLT ALARM	----------
F50-F54	Internal damage of the PSU.	PSU FLT ALARM	- service codes
F60	No communication	PSU FLT ALARM	- no communication with LCD panel
F61-F64	LCD damage	PSU FLT ALARM	- service codes
F65	Access unlocked	----------	- passwords unlocked

Event code	Description
I00	PSU start-up
I01	AC power restored
I02	AUX1 fuse replaced
	AUX2 fuse replaced
I03	BAT fuse replaced
I04	Battery connected
I05	Battery status: OK
I06	Battery temperature: OK
I07	AC voltage: OK
I08	EXTo output on
I09	EXTo output off
I10	Battery test – START
I11	Enclosure closed
I12	The Imax_a current exceeded
I13	The current has dropped below Imax_a

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